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ABSTRACT

This final report discusses the outcomes of a project that conducted six research studies to investigate the use of an effective teaching approach and visual display enhancements in content instruction for adolescents with learning disabilities. Four studies compared various components of the effective teaching approach with a traditional lecture approach to see the effects on acquisition and retention of content materials on students with mild disabilities. The studies investigated the effects a lecture plus effective teaching in the learning set phase of the instructional cycle, effective teaching in the presentation and guided practice phase of the instructional cycle, effective teaching in the independent practice phase of the instructional cycle, and a combination of effective teaching in the learning set, presentation and guided practice, and independent practice phases of instruction. The next study examined the role of the effective teaching approach and visual display interventions. The final study trained a regular education teacher to use the effective teaching approach in content instruction. Results found learning set activities and teacher-guided practice had positive effects on students, while teacher-directed independent practice did not help students meet the instructional demands of content classes. (CR)

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ED 412 702

Research on the Effective Teaching Approach and Visual Display Enhancement to Improve the Content Learning of Adolescents with Learning Disabilities

FINAL REPORT

Initial Career Award-
Pamela Hudson
Utah State University
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PROJECT PURPOSE

The purpose of this project was to investigate the use of an effective teaching approach and visual display enhancements in content instruction for LD adolescents. The following goals were completed for this project:

Goal 1: Empirically compare the effectiveness of an effective teaching approach and traditional lecture instruction on LD adolescents' acquisition and retention of content material.

Goal 2: Identify the characteristics of an effective visual display and empircally investigate the effects of two teaching approaches and visual display characteristics on LD adolescents' acquisition and retention of content material.

Goal 3: Train regular education teachers to teach content lessons using the effective teaching approach, and examine the effects on LD and nonLD adolescents's acquisition and retention of content material.

Goal 4: Disseminate research findings.

RESEARCH SUMMARIES

Six experimental studies and one research activity are proposed for this project. The first four studies compared various components of the effective teaching approach with a traditional lecture approach to see the effects on LD adolescents acquisition and retention of content material. The next study and research activity built on the findings of the first four studies by examining the role of the effective teaching approach and visual display interventions. In addition, the characteristics of an effective visual display were identified and how these characteristics influence content learning was examined. The final study extended the findings of the previous research activity and study by training a regular education teacher to use the effective teaching approach in

content instruction. Impact on the academic performance of LD and nonLD adolescents in content classes was examined.

GOAL 1: EMPIRICALLY COMPARE THE EFFECTIVENESS OF AN EFFECTIVE TEACHING APPROACH AND LECTURE INSTRUCTION ON LD ADOLESCENTS' ACQUISITION AND RETENTION OF CONTENT MATERIAL

Four studies were conducted to meet Goal 1 of this project. All three studies explore a component or combination of components from the "effective teaching" literature not previously investigated with content instruction or LD adolescents. In study 1, a traditional lecture approach was compared to a lecture plus effective teaching in the learning set phase of the instructional cycle. The purpose of this study was to investigate whether a single component of the effective teaching approach, the learning set, is powerful enough to increase students' learning as compared to traditional lecture. In study 2, a traditional lecture approach was compared to effective teaching in the presentation and guided practice phase of the instructional cycle. The purpose of this study, as in study 1, was to determine if a single component of the effective teaching approach, the presentation and guided practice phase, was powerful enough by itself to increase student learning as compared to traditional lecture. In study 3, a traditional lecture approach was compared to effective teaching in the independetn practice phase of the instructional cycle. The purpose of this study, as in studies 1 and 2, was to determine if a single component of the effective teaching approach, the independent practice phase, was powerful enough by itself to increase student learning as compared to traditional lecture. In study 4, a traditional lecture approach was compared to effective teaching in the learning set, presentation and guided practice, and independent practice phases of instruction. The purpose of this study was to examine whether all components of the effective teaching approach together will substantially improve student learning as compared to traditional lecture.

Study 1: Comparing the effects of an effective learning set with a traditional lecture approach

Research Questions

1. Will LD adolescents in effective learning set group perform higher or lower than LD adolsecents in the lecture group on a unit test ?

2. Will LD adolescents in the effective learning set group perform higher than LD adolescents in the lecture group on a maintenance test administered 3 weeks later ?

3. Will LD adolescents in the effective learning set group be more satisified with instruction than LD adolescents in the lecture group?

Methods

Subjects and Setting

Sixth and seventh graders who were enrolled at a middle school in a small college town in northern Utah and who had mild disabilities were potential participants for the study. Three criteria were used to select the students. First, all eligible students were administered a 20-item screening test to control for the possible effects of prior knowledge of the social studies content. Students had to score 50% or below on the curriculum-based screening measure to be considered for the study. Second, these students were asked to volunteer to participate and attend an after school study. Third, parents of volunteers had to: (a) agree their child could participate in the study, and (b) ensure their child's attendance and transportation for all days of the study. Thirty students met these criteria and were randomly assigned to experimental and control conditions. By the end of the first week, nine students had discontinued their participation due to absenteeism.

The final sample included 20 students with learning disabilities and one student with a communication disorder (CD). The CD student had been randomly assigned to the control group. All students: a) met state criteria for their specific disability, b) were Caucasian, and c) spent one to three periods per day in the special education resource room attending math and language arts classes. In addition, the majority of the students received social studies in the special education

resource room, while some students were mainstreamed into regular social studies classes. Demographic data for all subjects are displayed in Table 1. Analysis of Variance (ANOVA) tests were conducted on IQ and screening scores. No significant differences between groups were found on either measure. Because of the small sample size, data also were analyzed using effect sizes (ESs). Effect sizes are not affected by sample size and provide a standardized mean difference between groups (Borg & Gall, 1989). The ES for IQ was -.07 standard deviation (SD) units and the ES for the screening test was .63 SD units. The two groups did not differ on IQ score but a slight advantage was observed in the experimental group's content knowledge on the screening measure. To assure the CD student did not unduly influence the equality of the groups, the ANOVAs were conducted on the IQ and screening scores. No significant differences were found on either measure.

Table 1
Description of Subjects

	Experimental	Control
Total Sample (n)	9	12
Gender		
male (n)	7	10
female (n)	2	2
Grade		
sixth (n)	8	9
seventh (n)	1	3
IQ score		
mean	93.9	94.7
(SD)	(9.4)	(12.0)
Screening score		
mean	7.0	5.8
(SD)	(1.3)	(2.4)

The experimental and control conditions were conducted after school in the middle school resource room. The room was a regular-sized classroom with individual student desks arranged in

rows facing the front board. The teacher had 10 years experience as a resource teacher.

Materials

Lessons were specifically developed for this study on the American Indians and the Age of Discovery from American history textbooks. Content on the American Indians focused on the physical environments where tribes lived and their way of life. Age of Discovery content included the motivations and events that led up to the "third discovery" of America and European exploration of the continent. The lessons were scripted, i.e., all facts, concepts, and examples were listed in the sequence of presentation. Carnine's (1991) "sameness analysis" was applied to organize all facts and concepts around major ideas or principles. This approach integrates related facts and concepts around organizing constructs, deemphasizes the memorization of isolated facts, and promotes more holistic and meaningful understanding of history (Kinder & Bursuck, 1991). For example, on Days 1 and 2 the organizing principle was the causal relationship between the physical environment and the culture of the American Indian tribes. Information about each group of tribes was organized to demonstrate the same relationship. However, the organizing relationship for each content area was explicitly stated only once by the teacher. It was not pointed out again to determine whether students could independently infer the relationship.

During the lecture presentation by the teacher, overhead transparencies were used to display essential facts and concepts in a hierarchial fashion. Information was written in during appropriate times during the lecture to give students visual support for important information. A note-taking guide was provided to the students which was identical to the outline provided on the overhead transparencies. Students were instructed to take notes in this note-taking guide. Students in both groups could use the note-taking guide during the learning set. In the experimental group, students could look for the answer to an orally stated question (although they were encouraged to try and "remember"), and students in the control group used the note-taking guide to silently review during the learning set time. Additional materials included a map of North America and relevant pictures.

Measures

Content tests. A 20-item screening test was used to measure students' prior knowledge of the social studies content. Students had to score below 50% accuracy to be eligible for the study. Questions related to the American Indians, Age of Discovery, and the first English colonists were selected to ensure students did not have sufficient prior knowledge of the content presented during the study to interfere with study outcomes. Test items were multiple choice and matching. The test was read to students to eliminate the possibility that students' reading ability might interfere with demonstration of content knowledge.

Two 20-item curriculum-based measures were developed to measure student recall of the content contained in the four lessons. The content covered in each test equally represented the four content lessons. One test, the "unit test," was given the day immediately following the four days of instruction, and the second test, the "maintenance test," was administered three weeks later. Test questions included multiple choice, matching, sequencing events, and short answer. Test items were categorized as recall and inference questions. Recall questions asked student to remember informaton explicitly stated during the lecture (e.g, "Who made the third discovery of America?"). Inferential questions were based on information not explicitly stated during the lesson and required students to infer an answer from information explicitly stated. With the inferential question "Name one way the environment influenced the culture of the Arctic tribes," the causal relationship between the environment and culture was never stated by the teacher, only the facts about the environment and culture were stated. On the unit test, 15 items were recall questions and 5 questions were inferential. On the maintenance test, 14 questions were recall and 6 were inferential. Both tests included a variety of question formats. The unit test comprised 10 multiple choice, 7 short answer, and 3 numbering-events-in-sequence items. The maintenance test comprised 11 multiple choice, 6 short answer, and 3 matching items. The test items were read aloud by the teacher for both the unit and maintenance tests.

All tests were scored by a research assistant using answer keys developed by the researcher. Correct responses received one point; incorrect responses received no credit. Twenty-two percent of the tests were randomly selected and rescored by a second research assistant to determine the interscorer agreement of scoring procedures. The research assistant's records were compared item-by-item, and interscorer agreement was calculated by dividing the number of agreement by the number of items on the scored tests and multiplying by 100. Interscorer agreement for both the unit and maintenance tests was 99%.

Content validity . Content validity for the tests was established by the researcher, research assistant, and two social studies teachers. First, the researcher and research assistant compared scripted lessons and related objectives to the unit and maintenance tests to determine whether they accurately and fairly sampled the lesson content equally across both tests. Inconsistencies resulted in revisions of either the lessons or the tests. Next, two social studies teachers were asked to compare the lessons and tests to determine alignment. The teachers were specifically asked to verify that recall and inferential questions accurately represented the content presented. Reported inconsistencies resulted in lesson and/or test revisions.

Social Validity. In order to determine how students felt about the learning set (experimental group) or independent review (control group) and the lecture, a student satisfaction rating form was developed. Students were asked a total of six questions (see Table 2) -- three questions related to the learning set or independent review and three questions related to the lecture. Students rated instruction on a scale of "1" to "5" with a rating of "5" equaling completely satisfied and "1" indicating completely dissatisfied.

Verification of Independent Variable.

The fidelity of the instructional intervention was evaluated for two reasons: (a) to verify the independent variable occurred only in the experimental condition, and (b) to ensure the researcher, as the teacher, exhibited the designated behaviors in the experimental condition but not in the control condition. All lessons were videotaped and one-half of these were randomly selected

Table 2

Social Validation Questions and Student Responses

Question	Experimental Mean	Experimental (SD)	Control Mean	Control (SD)
1. Are you satisfied the time spent reviewing each class lecture made the information easier to understand?	4.6	.5	3.8	1.3
2. Are you satisfied the time spent lecturing made the information easy to understand?	4.2	.8	4.4	.7
3. Are you satisfied the time spent reviewing each class lecture made the information easier to remember?	4.7	.5	3.9	.8
4. Are you satisfied the time spent lecturing made the information easy to remember?	4.4	.9	3.9	.7
5. Are you satisfied the time spent reviewing helped you do better on the weekly quiz?	4.6	.5	3.5	.9
6. Are you satisfied the time spent lecturing helped you do better on the weekly quiz?	4.5	.9	3.8	1.2

and evaluated in three areas: coverage of social studies content, learning set procedures, and lecture procedures. For coverage of the social studies content, a research assistant observed the videotaped lesson, using a copy of the scripted lesson to mark all facts, concepts, and examples stated by the instructor during the lecture. For the experimental and control groups, 97 percent of the social studies content was covered exactly as scripted in the lessons.

For the instructional procedures, five types of data were collected on a data sheet: (a) the total time of the learning set; (b) the interaction between teacher and students during the review, summarized as the number of student opportunities to respond per minute; (c) the essential components of the learning set, i.e., verbal review of relevant material, stating

objectives, linking review to new objectives, providing a rationale, and stating performance expectations; (d) the total time of the lecture; and (e) the lack of interaction between teacher and students during the lecture (i.e., lecturing without discussion or initiation of questions). Table 3 demonstrates the learning set and lecture procedures were appropriately administered. There are two explanations for the different amounts of time spent in the learning set/independent review and lecturing. First, the control group spent less time in the independent review because once students had reviewed content in their note-taking guides (which was ever so brief for most students) and had indicated they were done, it was necessary to move on with the lesson. Second, lecture time was slightly longer for the experimental group because students asked a lot more questions than students in the control group.

Two research assistants independently evaluated the instructional procedures. One assistant randomly evaluated one-half of the videotapes. The second assistant independently evaluated a ranadom sample of the first assistant's tapes. Interobserver agreement ranged from 85% to 89% on the five types of instructional procedures used.

Table 3
Independent Variable Data

	Experimental Group	Control Group
Total learning set (min)	8.5	4.5
Review only/ independent review time (min)	7.5	4.5
Opportunities to respond per minute	4.5	0
Essential learning set components (%)	100	0
Lecture time	18	17
Teacher directed interaction during lecture	0	0

Procedures

Two weeks before beginning the study, students participated in a week-long practice session. The content was on the American Indians, the same topic as Days 1 and 2 of the study, but different groups of Indian tribes. This practice session allowed students to become familiar with the teacher, videotaping, classroom rules, and teaching procedures. The teacher conducted lessons and testing similar to the procedures to be used in the study but with different content.

During the study, four consecutive days were allotted for instruction for both groups. Students in both groups were taught the same academic content each day. The content covered cultures of the American Indian tribes in North America and the Age of Discovery. This topic is typically taught in eighth grade American History classes. On the fifth day, a unit test over the content of the four lessons was administered and students completed the

social validation measure. Three weeks later, an alternate form of the unit test, the maintenance test, was administered.

Experimental Group. At the beginning of each instructional lesson for the experimental group, the teacher introduced the learning set for the upcoming lesson. On Day 1, the learning set entailed reviewing main ideas from the previous week's lectures (the pilot study); on Days 2, 3, and 4 the review covered content from the previous days' lessons in cumulative form.

Several techniques were used for reviewing: true/false, specific question, and sequencing. With the true/false technique, the teacher made a statement based on previously learned content and all students were instructed to point the thumb of one hand up if the item was true and point the thumb down if it was false. This technique allowed the teacher to immediately see the responses of the whole group. Frequently, when the statement was false (e.g., The first discoverer of America was Vespucci), the teacher would follow up with a specific question (e.g., Who was the first discoverer of America?) and elicited a correct answer.

With specific question technique, the teacher asked a question (e.g., Who can name one fact about the culture of the Southeast tribes?) and called on an individual student for a response followed by asking other students for additional examples or asking whether the other students agreed with this response. With this technique, several students had opportunities to respond. For the sequencing technique, the teacher displayed a list of events on an overhead transparency, read each item aloud, and then asked individual students "What happened first?" "What happened second?" The true/false technique was used the most often because it provided all students opportunities to practice the material and it allowed the teacher to check the whole group's understanding of the review material. As previously stated, the specific question technique was typically used as a follow-up to false statements. The sequencing technique was used only once.

Correct student responses were followed by a brief form of verbal positive feedback such as "Right," "Good answer," or "Yes." Incorrect responses were followed by the teacher saying, "No," and then either giving a prompt to elicit the correct response or stating the correct response. The teacher moved into the lecture only when the majority of the class was responding correctly to the review questions.

After the review portion of the learning set had been conducted, the teacher stated the lesson objectives for the day (e.g., " At the end of class you will state three ways the environment influenced the culture of the Southeast tribes."). On Day 1, a rationale for the week's lesson was elicited from the students ("Why is it important to learn about the first discoverers of America?"). The teacher followed the objectives and/or rationale by stating expectations for student performance (e.g., "Remember to listen while I am talking and take notes on your note-taking guide when I am writing on mine.") Following the learning set, the teacher lectured for the remainder of the period.

Control Group. Each instructional day, students were directed to silently review their notes from the previous days' lessons and preview the current lesson by looking ahead at the headings and subheadings of the note-taking guide. When students were done reviewing-previewing, they were instructed to close their note-taking guides and put down their pencils to indicate they were ready to move onto the lecture. The lecture then began and students reopened their note-taking guide to the appropriate place to take notes.

Experimental Design

A posttest-only control group design (Campbell & Stanley, 1963) was used to analyze the effects of the experimental and control conditions on LD students' acquisition and maintenance of social studies content. Students were randomly assigned to control or experimental treatment groups.

Results

Content tests

Descriptive and statistical data for the unit and maintenance tests are displayed in Table 4. These data were analyzed using one-way ANOVAs to determine the effects of the treatment and control conditions on the students' test performance. On the unit test and maintenance tests, the ANOVAs revealed statistically significant treatment effects favoring the experimental group. When the ANOVAs were conducted again without the CD student's test scores, treatment effects were similar to the data with this student, that is, the experimental group performed significantly better than the control group on the unit and maintenance tests.

Another analysis using ANOVAs was conducted to determine whether the treatment differentially affected student responses to recall and inferential questions (see Table 4). On the unit and maintenance tests, student responses on the recall questions and inferential questions revealed significant treatment effects favoring the experimental group. Results were similar when the ANOVAs were conducted again without the CD student.

Socail Validation.

Student responses on the social validation measure were analyzed using a two-tailed t-test for independent samples. This test was used because it is robust to small sample sizes and departures from normality (Ferguson, 1981). Student responses were summarized and averaged in three ways. First, each student's responses to all six questions on the satisfaction survey were averaged to represent a total satisfaction score. These total satisfaction scores were averaged for each group (see Table 2) revealing no significant differences between the experimental and control groups ($p < .14$). Second, student responses relating to questions about the lecture presentation (3 of 6 questions) were averaged with no significant differences found between the groups ($p < .53$).

Table 4

Descriptive and Statistical Data for Unit and Maintenance Tests

	Experimental		Control			
	Mean	SD	Mean	SD	ES	F
Measure						
Unit test						
total	14.1	2.5	9.3	2.8	1.78	16.2**
factual	11.4	2.3	7.8	2.1	1.64	14.1**
inference	2.7	1.0	1.6	1.1	.98	5.5*
Maintenance test						
total	11.4	1.9	5.6	2.3	2.70	30.8**
factual	8.1	1.3	3.8	2.0	2.80	33.1**
inference	3.3	.8	1.8	.6	2.17	19.4**

* $p < .05$

** $p < .01$

Finally, on student responses to questions related to the learning set or independent review (3 of 6 questions), a significant difference was found favoring the experimental group ($p < .006$).

Discussion

The purpose of this study was to investigate the effects of delivering a learning set prior to a lecture on students with LD's test performance. The impetus behind the study was to investigate whether the effective teaching approach, specifically the prelesson phase of instruction, was applicable to content instruction and would help LD students meet the instructional demands of content classes. The results of this study suggest that when a package of four learning set activities is delivered prior to lecture presentations, students with LD perform better on a social studies unit test. If the scores on the unit test are translated into class grades, the mean score for the experimental group would equal 70% or a "C," whereas the mean score for the control group would equal 47% or an "F." This type of difference in grades is meaningful for students who typically have great difficulty acquiring social studies content. Results of the maintenance test indicate a larger difference between the groups, suggesting that not only did students in the experimental group acquire more information (unit test), but they retained the information. On the social validation survey, students in the experimental group clearly believed the learning set helped them to understand and remember the social studies content and do better on the unit test.

The positive effects of using a learning set in this study are consistent with the effective teaching literature validated on basic skill instruction (Rosenshine & Stevens, 1986). Several possible reasons exist for the success of these techniques with social studies content. First, the statement of objectives and the review helped students to focus their attention on the essential information, particularly for students with LD who have

difficulty in discriminating relevant and irrelevant information (Tarver, 1981). Second, the review provided students with opportunities to recall content information and practice that information. It is likely the frequent, cumulative, and distributed reviews enhanced students' learning (Dempster, 1991). Third, the teacher's positive feedback reinforced students' recall and understanding, and corrective feedback provided students with accurate information.

The fact that students in the experimental group retained the information over time was an added benefit. It seems that the techniques which helped students acquire the information (objectives, review, feedback) also aided retention. However, it may be the review played a particularly important role. As suggested by Dempster (1991), additional learning occurs when students are given the opportunity to successfully retrieve information previously acquired. Since the review required students to retrieve content information from the previous day's lesson, their ability to recall the information was strengthened.

A secondary purpose of this study was to examine the differential effects of the learning set on students' responses to recall and inferential test questions. The outcomes of this study suggest that students in the experimental group performed better on recall and inferential test questions than the control group. Kinder and Bursuck (1991) suggest that recall of content information is facilitated by a curriculum that stresses the relationship between facts and concepts. However, the content information for both groups in this study was organized in this way and students in the control group still had difficulty remembering facts when compared to the experimental group. The lower scores for the control group suggest that while the organization of content information may be important, it is not sufficient for ensuring students' acquisition of social studies content. Based on the findings of this study, the use effective teaching practices such as review questions, positive and corrective teacher feedback, and statements of lesson objectives are an assured

method of increasing students' literal comprehension of lecture content.

The connection between organization of content information, effective teaching practices, and student accuracy can also be seen in students' responses to inferential test questions. Carnine (1991) suggests that both organization of content information and effective teaching practices are necessary if students with disabilities are to learn "high-order" thinking skills. High-order thinking skills require students to go beyond what has been explicitly stated by the teacher and includes drawing inferences, applying information, and problem solving. Carnine states that three requirements are essential for teaching high-order thinking skills: (a) the curriculum (content information) must be organized to show the relationship between facts and concepts, (b) teacher expectations must communicate that the students are capable of high-order thinking, and (c) effective teaching techniques must be used to present the lesson (e.g., frequent questions, constructive feedback, active monitoring). As noted previously, all content information were organized around larger ideas or relationships for both groups. However, the second requirement, teacher expectations for students to use high-order thinking, only occurred with the experimental group when the teacher stated lesson objectives (e.g., "You will describe how the culture of the tribes were similar and different."). The third requirement, efficient teaching techniques, were only used for the experimental group during the interactive review when the teacher provided students opportunities to respond to frequent questions which were followed by positive and corrective feedback. While all three requirements were used to some extent with students in the experimental group, students in the experimental group still performed below an acceptable level, answering 54% of the inferential questions correctly. It may be that students needed opportunities to practice applying the content knowledge measured by the inferential questions and receive feedback. For example, on Day 1, the teacher demonstrated to students how to compare and contrast the culture of two groups of American Indian tribes. However, students were

not given the opportunity to practice this skill before the unit test. The opportunity to practice these skills along with positive and corrective feedback from the teacher prior to the test could have increased students' abililty to answer the inferential test items.

The results of this study have important implications for classroom teachers and special educators teaching social studies content. That is, well-organized content information may not be sufficient to promote LD students' acquisition of factual information and high-order thinking skills. However, when teachers consistently provide effective practice during a review, communicate lesson objectives and task expectations, and provide rationales at the beginning of a new unit, students can successfully acquire the social studies content.

Several directions for future research can be followed from this study. First, the set of techniques used in this study could be further analyzed to determine if all the techniques are needed to produce positive student outcomes; for example, comparing the individual contribution of the statement of objectives and review. Since the review represented the largest portion of time spent in the learning set and the highest level of teacher-student interaction, it might be anticipated the review would be the most powerful component of the learning set. This needs validated by research.

A second area to explore is the impact of effective teaching practices in other parts of the lesson; for example, investigating whether effective teaching practices at the presentation and guided practice phase of instruction would provide similar gains as those in the learning set study. Furthermore, an investigaton of effective teaching practices at both the learning set and presentation and guided practice phases of instruction would clarify interaction questions after each teaching method had been studied separately. These additional practice opportunities may increase LD students' performance on content tests beyond the "C" grade as evidenced in this study.

Another area for future research is the generalizability of the learning set techniques

to different content areas, students, and settings. For example, the effectiveness of the learning set could be investigated: (a) in content areas such as health or science, (b) with different age students such as high school, and (c) with regular classroom teachers to determine whether the techniques are useful for all students in a mainstream setting. In a regular classroom setting, the use of the learning set prior to other methods of instruction such as demonstrations, independent reading, and seatwork could be examined. All of these directions for future research will provide more information on the usefulness of the learning set techniques for content instruction

Study 2: Comparing the effects of effective presentation and guided practice with traditional lecture

In study 1, a single component of the effective teaching approach was examined to determine the effects on LD adolescents' acquisition and retention of content material. The purpose of study 2 was to investigate a second component of the effective teaching approach, presentation of new material and guided practice, and examine whether this single component is powerful enough by itself to increase student learning as compared to traditional lecture.

Research Questions

1. Will LD adolescents in the effective presentation and guided practice group perform higher or lower than LD adolescents in the traditional lecture group on a unit test?
2. Will LD adolescents in the effective presentation and guided practice group perform higher or lower than LD adolescents in the lecture group on a maintenance test administered 2 weeks later ?
3. Will LD adolescents in the effective presentation and guided practice group be more satisified with instruction than LD adolescents in the lecture group?

Methods

Subjects and Setting

The procedure and criteria for recruiting subjects in this study was the same as in Study 1; the setting and teacher was also the same. A total of 18 students were included in the study: 8 LD subjects in the experimental group (7 sixth graders, 1 seventh grader; 2 girls, 6 boys) and 9 LD students and 1 communication disordered (CD) student in the control group (7 sixth graders, 3 seventh graders; 8 boys, 2 girls). All students were Caucasian and attended the resource room one to three periods per day for math, language

arts, and social studies. The CD and LD students met state criteria for their specific disability. The CD student was diagnosed using the state of Utah definition (Special Education Rules, May 1993) requiring a disorder of speech, language, and/or hearing to such a degree that specialized instruction is necessary. In identifying students as learning disabled, Utah uses the federal definition, IDEA-B Regulations, 34 CFR 300.7, and requires a severe discrepancy exists between measured achievement areas using a validated statistical method.

Students' IQ and screening test scores were compared prior to the beginning of the study and again after the study was completed because of the change in sample size. Comparison of the experimental groups before and after subject attrition revealed both IQ and screening test scores were comparable across the treatment and control groups. Attrition did not differentially affect the composition of the experimental groups. Because of the small sample size, data also were analyzed using effect sizes (ESs). The two groups were found to be comparable (Table 1). The ESs verified little difference existed between the groups and analysis of variance (ANOVA) tests indicated no significant differences on either measure (see Table 1). To ensure the one CD student in the control group did not unduly influence the equivalency of the groups, additional ESs and ANOVAs were conducted on the IQ and screening test scores without the CD student. No differences were found on either measure.

Materials

The content lessons covered the settlement of the English colonies. The researcher organized the content of these lessons in the same way as in Study 1. All content was taught from scripted lesson plans. Essential facts and concepts were depicted on overhead transparencies for use by the teacher. A note-taking outline, identical to the overhead

Table 1
Comparison of Subjects' IQ and Screening Test Scores

Experimental Group		Control Group		F	ES
IQ		IQ			
Mean:	94.88	Mean:	96.7	0.12*	-.16
SD:	9.4	SD:	12.2		
Screening Test		Screening Test			
Mean:	6.4	Mean:	5.7	0.48*	.37
SD:	1.2	SD:	2.5		

* not significant

transparencies, was provided to each student. The teacher also used overhead transparencies of maps that depicted the location of the colonies.

Measures

Content tests. A 20-item screening test was developed to check students' prior knowledge of the lecture content. It was the same screening test used in Study 1. Two 20-item curriculum-based measures were developed from the week's lesson to measure students' level of factual recall and skill in answering inferential questions. The first test was administered on the day immediately following the four days of instruction and was called a "unit" test. The second test was administered two weeks later and was called a "maintenance" test. Test items included multiple choice, true/false, matching, and short answer. On the unit test, 15 items were considered factual questions that represented information explicitly stated by the teacher; five questions were considered inferential because they required students to infer from information explicitly stated in the lecture. Question formats included 15 multiple choice, 3 true/false, and 2 short answer. On the maintenance test, 16 questions were factual and 4 were inferential. Question formats included 9 multiple choice, 8 matching, and 3 short answer. All three tests

were read to students to eliminate the possibility of students' reading ability interfering with demonstration of content knowledge.

Procedures for obtaining interscorer reliability were the same as in Study 1. Interscorer agreement for the unit and maintenance curriculum-based measures was 99%.

Content validity. Content validity for the tests was examined by the researcher, one research assistant, and two social studies teachers in the same manner as described in Study 1. The tests were found to accurately and fairly sample the lecture content; the difficulty levels were comparable.

Social Validation. A rating form was developed to measure how students felt about the lecture and practice time following each lecture segment. Students in the experimental and control groups were asked three questions each about the lecture and practice time (See questions in the Results section, Table 4). Students rated instruction on a scale of 1 to 5 with 5 equaling completely satisfied.

Verification of Independent Variable. Two research assistants evaluated the fidelity of the instructional interventions from videotaped lessons. The same procedures were followed as described in Study 1. Ninety-nine percent of the social studies content was covered exactly as listed on the scripted lesson plans for the experimental and control groups. Data collected on for the instructional procedures is displayed in Table 2. The lecture and guided practice were found to be implemented as prescribed. In addition to the content coverage, the lectures for both the experimental and control groups were deemed equivalent on such variables as the teacher enthusiasm and use of maps and pictures that 'concretized' the presentation of content. A second research assistant independently evaluated one-half of the randomly selected lessons. Interobserver agreement ranged from 85% to 88%.

Table 2
Independent Variable Data

	Experimental Group	Control Group
Total lecture (min)	18.1	16.5
Teacher initiated interaction during lecture	0	0
Total guided practice (min)	7.9	5.9
Opportunities to respond per minute	2.9	0

Procedures

Four consecutive days of instruction were allowed for the experimental and control groups. Students in both groups were taught the same academic content each day. The lecture for each day was broken into two to three natural segments of information. Lectures were delivered by the teacher without discussion or teacher-initiated questions; however the teacher did answer questions initiated by students. Each lecture segment was followed by a practice time for both groups. On the fifth day, the unit curriculum-based test was administered and students completed the social validation survey. Two weeks later, an alternate form of the curriculum-based test, the maintenance test, was administered. The experimental and control conditions are described below.

Experimental condition Each day the teacher began by presenting the first lecture segment, followed by teacher-guided practice (TGP), then another lecture segment and practice time, and so on. The TGP always entailed either oral true/false statements or

specific questions about the preceding lecture segment. With each statement/question the teacher attempted to get as many students responding as possible. In this way, most students were actively engaged in processing the lecture content and the teacher could check students' understanding of the previous lecture segment. Two techniques were used to facilitate this interaction: (a) specific questions were directed to individual students with feedback requested from the rest of the class showing agreement, and (b) true/false questions were directed to the whole class using a thumbs up/down group response.

Teacher feedback was provided immediately for correct and incorrect student responses as described in Study 1.

Control condition. The number and sequence of lecture segments and pauses in the experimental condition were exactly matched to the control condition each instructional day. However, during the practice time, students were directed to silently and independently study the information in their notes from the preceding lecture segment. When students were done studying, they were told to put their pencils down and look-up at the teacher. The teacher then continued with the next lecture segment.

Research design

A posttest-only control group design (Campbell & Stanley, 1963) was used to analyze the effects of the experimental and control conditions on LD students' acquisition and maintenance of social studies content. This design is effective with short treatment conditions and avoids the practice effects of a pre- and post-test design which could interfere with the information presented during the treatment condition. All students were randomly assigned to treatment conditions.

Results

Curriculum-based measures

Descriptive and statistical data for the unit and maintenance measures are displayed in Table 3. These curriculum-based measures were analyzed to determine the learning effects

of the experimental and control conditions on students' test performance using ESs and one-way ANOVAs. On the unit and maintenance measures, the ES data showed the treatment resulted in larger gains on both tests. The ANOVAs concurred with the ES data and resulted in a statistically significant treatment effect favoring the experimental group. To determine whether the CD student's data influenced the study outcomes, the ESs and ANOVAs were conducted without this student. Treatment effects were similar to the data with the CD student. The ESs without the CD student were slightly higher for the unit test (ES = 1.23) and the maintenance test (ES = 1.11). Likewise, the experimental group performed significantly better than the control group on the unit and maintenance tests when the ANOVAs were conducted.

Table 3
Descriptive and Statistical Data for Unit and Maintenance Tests

	Experimental		Control			
Measure	Mean	SD	Mean	SD	F	ES
Unit test						
Total	14.40	2.39	11.0	3.16	6.24*	1.07
Factual	11.00	1.93	8.0	3.09	5.71*	.97
Inferential	3.38	0.92	3.0	0.67	1.01	.57
Maintenance test						
Total	14.00	2.62	9.70	4.83	5.09*	.89
Factual	11.50	1.93	8.40	4.33	3.52	.72
Inferential	2.50	.93	1.30	0.95	7.26**	1.26

* $p < .05$
** $p < .016$

Analyses were conducted to determine whether the treatment influenced student responses to factual and inferential questions (see Table 3). For the factual questions, the experimental group scored higher on both the unit and maintenance measures. The ESs revealed greater gains for the experimental group on the unit test than on the maintenance test. However, the experimental group still scored much higher than the control group on the maintenance test. The ANOVAs demonstrated a comparable pattern although the sample size appeared to affect the findings on the maintenance test where the control group showed more variability in responses.

Similarly, the experimental group scored slightly higher than the control group on the inferential questions for both the unit and maintenance measures. However, only the maintenance test resulted in larger ES gains and statistically significant results on the ANOVA. Results were comparable when the ESs and ANOVAs were run again without the CD student.

Social Validation

Results of student responses on the student satisfaction survey were analyzed using a two-tailed t-test for independent samples (Table 4). Student responses were averaged in three ways yielding: (a) total satisfaction score with no significant differences between the groups, (b) responses relating to lecture presentation were calculated with no significant differences between the groups, and (c) responses related to satisfaction with the pause time with a significant difference found favoring the experimental group ($p < .05$).

Discussion

The purpose of this study was to examine the use of effective teaching practices during the presentation and guided practice phase of instruction on LD students' test performance. The results from this study indicate that, on the whole, the TGP is an effective method for LD students. Students in this group performed better on both the unit and maintenance measures. This finding suggests that when TGP follows short lecture segments, LD students acquire and retain content information better than when student independent study follows the lecture segments (see total scores).

When the type of test question was analyzed, the TGP students consistently performed better than students in the control group on factual and inferential questions. However, on the ANOVAs not all comparisons were statistically significant. The TGP approach demonstrates LD students' factual knowledge base improved. However, longer-term retention, although comparable to immediate retention (i.e., similar mean scores), was not statistically confirmed. On the inferential questions, the results indicate that both methods resulted in comparable scores on the unit test. That is, students were able to answer inferential questions equally well. However, over time (maintenance test), students in the TGP group retained the knowledge and skill necessary to answer inferential questions significantly better than the control group.

Table 4

Social Validation Questions and Student Responses

Question	Experimental Mean	Experimental SD	Control Mean	Control SD
1. Are you satisfied that the time spent practicing information during class made the information easier to understand?	4.4	.7	3.5	1.3
2. Are you satisfied that the time spent lecturing made the information easy to understand?	4.4	1.1	4.5	.7
3. Are you satisfied that the time spent practicing information during class made the information easier to remember?	4.4	.9	3.1	1.4
4. Are you satisfied that the time spent lecturing made the information easy to remember?	4.4	.7	3.8	1.4
5. Are you satisfied that the time spent practicing helped you do better on the weekly quiz?	4.8	.4	3.7	.9
4. Are you satisfied that the time spent lecturing helped you do better on the weekly quiz?	4.4	.7	4.2	1.0

The set of effective teaching techniques used in this study during lecture presentations appears successful for teaching the LD students in this study. Although both groups had the lecture content broken into smaller units of information, the TGP helped the LD students in a number of ways. Considering LD students' poor listening skills (Schumaker & Deshler, 1984), it is likely teacher questions helped students to focus on key

information in the lecture and provided them the opportunity to actively process the content just presented in lecture. It has been suggested that active processing helps students to transfer new content from working memory to long-term memory (Rosenshine, 1986a), recoup lost information (Rowe, 1976), and correct misunderstandings (Rowe, 1976). This active processing combined with the high level of interaction between teacher and students provides a likely explanation for why students in the TGP group initiated more questions than students in the control group. Students in the TGP group also benefited from the teacher's reinforcement of correct student responses and correction of misunderstandings.

As for LD students in the control group who were left to their own devices during the pause time, it was not surprising they were not successful. Given LD students' poor independent work habits (Schumaker & Deshler, 1984), it is likely most students in the control group did not have the skill or motivation to actively process the previous lecture segment. In such cases, the teacher's direction may be needed to facilitate learning.

Study 3: Comparing the effects of independent practice with a traditional lecture approach

In study 2, the presentation and guided practice phase of the effective teaching approach was compared to traditional lecture. It was investigated whether this single component would be powerful enough by itself to increase student learning. In study 3, the independent practice phase of the effective teaching approach was compared to traditional lecture. The purpose of this study was to examine whether all independent practice by itself would substantially improve student learning as compared to traditional lecture. The outcomes of the three studies may suggest whether single components of the effective teaching approach are less powerful, equal to, or more powerful than one another.

Research Questions

1. Will LD adolescents in effective teaching group perform higher or lower than LD adolsecents in the lecture group on a unit test ?
2. Will LD adolescents in the effective teaching group perform higher than LD adolescents in the lecture group on a maintenance test administered 2 weeks later ?
3. Will LD adolescents in the effective teaching group be more satisified with instruction than LD adolescents in the lecture group?

Methods

Subjects & Setting

Sixteen LD students participated in this study including 10 LD students in the experimental group (7 boys and 3 girls) and 6 LD students (5 boys and 1 girl) in the control group. All students were Caucasia and attended the resource room one to three periods per day for math, language arts, and social studies. The LD students met state criteria for specific learning disabilities. Intelligence quotient (IQ) scores were collected from student records for all subjects and compared prior to the beginning of the study. Comparison of the experimental and control groups revealed

IQ test scores were comparable across groups. The setting and teacher were the same as described in Study 1.

Materials

The content lessons covered the influence of the environment on the culture of regional American Indian tribes. Content was organized in the same manner as Studies 1 and 2. All lessons were scripted. Essential facts and concepts were depicted on overhead transparencies for use by the teacher. The identical outline was provided to the students for note-taking.

Measures

Three 20-item curriculum-based measures were developed from the week's lesson to measure students' level of factual and inferential knowledge. The first test was a pretest designed to determine students' prior knowledge of the lesson content. The second test, or "unit" test was administered on the fifth day following four days of instruction. The third test, or "maintenance" test, was administered two weeks following instruction. A similar test format and distribution of question types was used in this study, as described in Study 1.

Interscorer reliability was calculated in the same manner described in Study 1. Content validity for the tests was conducted in the same manner as described in Study 1. Two research assistants evalulated the fidelity of the instructional interventions in the same way as described in Study 1.

A rating form was developed to measure how students felt about the lecture and practice time at the end of class. Students in the experimental and control groups were asked three questions each about the lecture and practice time, similar to the form used in Studies 1 and 2. Students rated instruction in the same way as previously described.

Procedures

Four consecutive days of instruction were allowed for the experimental and control groups. Students in both groups were taught the same academic content each day. Lectures were delivered by the teacher without discussion or teacher-initiated questions; however the teacher did answer

questions initiated by students. The end of the lecture was followed by a practice time for both groups. On the fifth day, the unit curriculum-based test was administered and students completed the social validation survey. Two weeks later, an alternate form of the curriculum-based test, the maintenance test, was administered. The experimental and control conditions are described below.

Experimental condition Each day the teacher began by presenting the lecture and followed the lecture with a written practice sheet asking students questions about the day's lecture; some questions were included from the previous day's lectures. The questions included fill-in the blank with a word box below for students to select the correct answers. The teacher circulated and provided and positive and corrective feedback, as described in Study 1.

Control condition. The amount of content in the experimental condition was exactly matched to the control condition each instructional day. However, during the practice time, students were directed to silently and independently study the information in their notes from the preceding lecture. When students were done studying, they were told to put their pencils down and look-up at the teacher.

Research design

A pre/post test group design (Campbell & Stanley, 1963) was used to analyze the effects of the experimental and control conditions on LD students' acquisition and maintenance of social studies content. All students were randomly assigned to treatment conditions.

Results

Measures	Experimental Mean	SD	Control Mean	SD	Effects
Pretest	5.30	2.06	6.5	3.56	t = .75
Unit Test	9.00	2.58	7.33	1.63	F = 3.69
Maintenance	7.9	3.57	8.33	6.83	F = .00

No significant differences were found between the experimental and control groups the pretest, unit, or maintenance tests.

Discussion

The purpose of this study was to investigate the effects of delivering teacher-directed independent practice on LD students test performance. The results of this study suggest that teacher-directed independent practice does not help students meet the instructional demands of content classes. This is not surprising. "Seatwork," as it is traditionally called, is not powerful enough in itself to facilitate learning, however it may be an important component when combined with effective teaching techniques at other phases of the instructional lesson.

Study 4: Comparing the effects of effective learning set, presentation and guided practice, and independent practice with a traditional lecture approach

In study 3, the independent practice phase of the effective teaching approach was compared to traditional lecture. It was investigated whether this single component would be powerful enough by itself to increase student learning. In study 4, all three components of the effective teaching approach were compared to traditional lecture. The purpose of this study was to

examine whether all components of the effective teaching approach together would substantially improve student learning as compared to traditional lecture. The outcomes of the four studies indicated whether single components of the effective teaching approach were less powerful, equal to, or more powerful than the combined components of the effective teaching approach as compared to lecture.

Research Questions

1. Will LD adolescents in effective teaching group perform higher than LD adolsecents in the lecture group on a unit test ?
2. Will LD adolescents in the effective teaching group perform higher than LD adolescents in the lecture group on a maintenance test administered two weeks later ?
3. Will LD adolescents in the effective teachingt group be more satisified with instruction than LD adolescents in the lecture group?

Methods

Subjects and Setting

The same subjects described in Study 3 participated in this study. The setting was identical to the previous studies.

Materials

The content lessons covered the Age of Discovery and was organized in the same manner as Studies 1, 2, and 3. All lessons were scripted. Essential facts and concepts were depicted on overhead transparencies for use by the teacher. The identical outline was provided to the students for note-taking.

Measures

Three 20-item curriculum-based measures were developed from the week's lesson to measure students' level of factual and inferential knowledge. The first test was a pretest designed to determine students' prior knowledge of the lesson content. The second test, or "unit" test was

administered on the fifth day following four days of instruction, and the third test, called the "maintenance" test, was administered two weeks following instruction. A similar test format and distribution of question types was used in this study, as described in Study 1.

Interscorer reliability was calculated in the same manner described in Study 1. Content validity for the tests was conducted in the same manner as described in Study 1. Two research assistants evalulated the fidelity of the instructional interventions in the same way as described in Study 1.

A rating form was developed to measure how students felt about the lecture and practice time at the end of class. Students in the experimental and control groups were asked three questions each about the lecture and practice time, similar to the form used in Studies 1 and 2. Students rated instruction in the same way as previously described.

Procedures

Four consecutive days of instruction were allowed for the experimental and control groups. Students in both groups were taught the same academic content each day. The teacher began class with a learning set. The lecture for each day was broken into two to three natural segments of information. Lectures were delivered by the teacher without discussion or teacher-initiated questions; however the teacher did answer questions initiated by students. Each lecture segment was followed by a practice time for both groups. On the fifth day, the unit curriculum-based test was administered and students completed the social validation survey. Two weeks later, an alternate form of the curriculum-based test, the maintenance test, was administered. The experimental and control conditions are described below.

Experimental condition At the beginning of each lesson the teacher introduced the learning set. This began by the teacher reviewing the previous days' lessons in a cumulative form. The same techniques described in Study 1 were used here. After the review, the teacher stated the lesson objectives for the day and expectations for student performance. Next, the teacher presented the first lecture segment, followed by teacher-guided practice, then another lecture

segment and guided practice, and so on. The teacher-guided practice always entailed oral true/false statements or specific questions about the preceding lecture segment. The same questioning and feedback techniques described in Study 2 were used here. Following the last lecture segment and guided practice, a written independent practice worksheet was distributed asking students questions about the day's lecture; some questions were included from the previous day's lectures. The questions included fill-in the blank with a word box below for students to select the correct answers. The teacher circulated and provided and positive and corrective feedback.

Control condition. Each instructional day, students were directed to silently review their notes from the previous days' lessons and preview the current lesson. When students were done, the teacher began the first lecture segment followed by a silent practice time. The number and sequence of lecture segments and practice times in the experimental condition were exactlly matched to the control conditions. However, during the practice time, students were directed to silently and independently study the information in their notes from the preceding lecture segment.

Research design

A pre/post test group design (Campbell & Stanley, 1963) was used to analyze the effects of the experimental and control conditions on LD students' acquisition and maintenance of social studies content. All students were randomly assigned to treatment conditions.

Results

Measures	Experimental		Control		Effects
	Mean	SD	Mean	SD	
Pretest	7.00	3.11	6.88	1.96	t = .09
Unit test	13.5	3.46	10.29	3.55	F = 2.46
Maintenance	12.37	4.10	8.14	4.74	F = 2.33

No significant differences ($p < .05$) were found between the experimental and control groups on the pretest, unit, or maintance tests.

Discussion

The purpose of this study was to examine whether all components of the effective teaching approach together would substantially improve student learning as compared to traditional lecture. Although student performance on unit and maintence tests favored the experimental group, statistical differences were not significant. These outcomes were surprising. If the learning set by itself significantly increased students performance, and teacher-guided practice significantly increased student performancce, it seems logical to assum that more teacher-directed practice would produce equivalant or better results. Several factors could explain these results. The subjects in this study were different than those in the learning set and guided practice studies. It is possible, despite random assignment, pretesting, and the same category of exceptionalitie, that the students in the first two studies had stronger abilities. Secondly, the content and tests may have been more difficult and the techniques were not sufficient to counterbalance its influence. Finally, it is possible that more practice is not better, particularly when consolidated in a short amount of time. Perhaps students were bored with the repetition. At this point in the series of investigations it seemed important to clarify the outcomes of this study and I petitioned the project director to re-do this study. However, he insisted I move on with the studies as I had originally proposed, which I did.

GOAL 2: IDENTIFY THE CHARACTERISTICS OF AN EFFECTIVE VISUAL DISPLAY AND DETERMINE THE EFFECTS OF 2 TEACHING APPROACHES AND VISUAL DISPLAY CHARACTERISTICS ON LD ADOLESCENTS' ACQUISITION AND RETENTION OF CONTENT MATERIAL

In Goal 1 research (studies 1, 2, 3, and 4), the influence of the effective teaching approach on LD adolescents' acquisition and retention of content material was investigated. Goal 2 studies extended these findings by examining the role of the effective teaching approach in visual display interventions. In addition, the characteristics of an effective visual display were identified. Although several researchers have investigated the effectiveness of visual displays on LD adolescents (e.g., Bulgren et al. 1988; Darch & Carnine, 1986; Horton et al. 1990), no one has controlled for these two variables by addressing how specific teaching procedures and visual display characteristics influence students' aacademic performance. One research activity and one study were completed to meet Goal 2 of this project. The research activity was designed to verify the characteristics of effective visual displays. Once the essential characteristics of an effective visual display were identified, study 5 investigated the role of the visual display in facilitating LD adolescents acquisition and retention of content material.

Research Activity 1: Identify Essential Visual Display Characteristics

Research Question

1. Given a series of textbook passages, each passage accompanied by a learning objective and a visual display, what characteristics of the visual display do expert judges identify as effective and ineffective?

Methods

Participants

Three expert judges were asked to participate in this research activity. These experts had worked with visual displays in a teaching, training, and/or research. Participants were Jan Bulgren at the University of Kansas, Joe Crank at the University of Nevada at Las Vegas, and Ben Lignugaris-Kraft at Utah State University.

Expert Evaluation of Visual Displays

Based on the visual display characteristics synthesized from the literature (Bulgren & Crank, in press; Engelmann & Carnine, 1982; Lovitt, 1989) created a list of visual display characteristics. Next, the researcher selected a series of textbook passages and identified a learning objective for each passage. Visual displays were developed for each passage based on the seven visual display characteristics identified above; an evaluation checklist was developed for evaluating the text passages + visual displays. The expert judges were asked to read the textbook passage and learning objective, examine the visual display, describe what characteristics of the visual display they feel are present or absent, and rate the importance of each characteristic in the display.

Expert judges indicated that seven characteristics were necessary for an effective visual display:

1. The display is aligned to lesson objectives.
2. The display has not more than 10 - 15 pieces of information.
3. The shape and arrangement of cells depicts the relationship of information.
4. All information is depicted is a cell.
5. Information is written with the fewest words.
6. Adaptations or prompts are added to help low achievers.
7. A main idea heading is provided.

Study 5 : Comparing the effects of effective teaching and effective teaching plus visual display

In research activity 1 the characteristics of an effective visual display were validated. The next step was to examine the role of the visual display and the effective teaching approach in facilitating LD adolescents content learning.

Research Questions

1. Will LD adolescents perform higher or lower in the effective teaching group or effective teaching plus visual display group on the unit test?
2. Will LD adolescents perform higher or lower in the effective teaching group or effective teaching plus visual display group on the maintenance test administered two weeks later?
3. Will LD adolescents in the effective teaching group or effective teaching plus visual display group be more satisfied with instruction?

Methods

Subjects and Setting

Sixth and seventh graders who were enrolled at a middle school in a small college town in northern Utah and who had mild disabilities were potential participants for the study. The same criteria used in selecting participants for previous studies were used here. The final sample included 17 students with learning disabilities. All students: a) met state criteria for their specific learning disabilities, b) were Caucasian, and c) spent one to three periods per day in the special education resource room attending math and language arts classes. In addition, the majority of the students received social studies in the special education resource room, while some students were mainstreamed into regular social studies classes. Analysis of Variance (ANOVA) tests were conducted on IQ scores, and no significant differences between groups were found.

The experimental and control conditions were conducted after school in the middle school resource room. The room was a regular-sized classroom with individual student desks arranged in rows facing the front board. The teacher had 10 years experience as a resource teacher.

Materials

Lessons were specifically developed for this study on government in the American colonies. The lessons were scripted, i.e., all facts, concepts, and examples were listed in the sequence of presentation. Carnine's (1991) "sameness analysis" was applied to organize all facts and concepts around major ideas or principles. During the lecture presentation by the teacher,

overhead transparencies were used to display essential facts and concepts in a hierarchial fashion. Information was written in during appropriate times during the lecture to give students visual support for important information. A note-taking guide was provided to the students which was identical to the outline provided on the overhead transparencies. Students were instructed to take notes in this note-taking guide. Students in both groups could use the note-taking guide during the learning set.

Measures

Content tests. Three 20-item curriculum-based measures were developed to measure student prior knowledge and recall of the content contained in the four lessons. The content covered in each test equally represented the four content lessons. The first test, the "pretest" was given two weeks prior to the beginning of instruction. The second test, the "unit test," was given the day immediately following the four days of instruction, and the third test, the "maintenance test," was administered two weeks later. Test questions included multiple choice, matching, sequencing events, and short answer. Test items for the pretest were all factual, whereas questions for the unit and maintence tests were recall and inference questions (see description in Study 1).

Content validity . Content validity for the tests was established by the researcher, research assistant, and two social studies teachers, as described in Study 1.

Social Validity. In order to determine how students felt about the learning set (experimental group) or independent review (control group) and the lecture, a student satisfaction rating form was developed similar to the one described and depicted in Study 1, Table 2.

Verification of Independent Variable.

The fidelity of the instructional intervention was evaluated to verify the independent variable occurred only in the experimental condition, and to ensure the researcher, as the teacher, exhibited the designated behaviors in the experimental condition but not in the control condition. All lessons were videotaped and one-half of these were randomly selected and evaluated, as

described in Study 1. For the experimental and control groups content was covered as scripted in the lessons.

For the instructional procedures, five types of data were collected on a data sheet, as described in Study 1. All effective teaching techniques and lecture procedures were appropriately administered. In addition, each visual display used in the experimental condition was evaluated for the seven visual display characteristics

Two research assistants independently evaluated the instructional procedures. One assistant randomly evaluated one-half of the videotapes. The second assistant independently evaluated a random sample of the first assistant's tapes. Interobserver agreement ranged from 83% to 93% on the five types of instructional procedures used.

Procedures

Two weeks before beginning the study, students took the pretest. During the study, four consecutive days were allotted for instruction for both groups. Students in both groups were taught the same academic content each day. The content covered governments of the American colonies. This topic is typically taught in eighth grade American History classes. On the fifth day, a unit test over the content of the four lessons was administered and students completed the social validation measure. Two weeks later, an alternate form of the unit test, the maintenance test, was administered.

Experimental Group. At the beginning of each lesson the teacher introduced the learning set. This began by the teacher reviewing the previous days' lessons in a cumulative form. The same techniques described in Study 1 were used here. After the review, the teacher stated the lesson objectives for the day and stated expectations for student performance. Next, the teacher presented the first lecture segment, followed by teacher-guided practice, then another lecture segment and practice time, and so on. Visual displays were used to depict the new material. The teacher-guided practice always entailed oral true/false statements or specific questions about the preceding lecture segment and were linked to the visual display. The same questioning and

feedback techniques described in Study 2 were used here. Following the last lecture segment and guided practice, a written independent practice worksheet was distributed asking students questions about the day's lecture; some questions were included from the previous day's lectures. The questions included fill-in the blank with a word box below for students to select the correct answers. The teacher circulated and provided and positive and corrective feedback.

Control condition. Procedures for the control condition were identical to those of the experimental condition with one exception - instead of using visual displays, a notetaking guide was used, as described in Study 1.

Experimental Design

A pre/post-test design (Campbell & Stanley, 1963) was used to analyze the effects of the experimental and control conditions on LD students' acquisition and maintenance of social studies content.

Results

	Experimental		Control		
Measures	Mean	SD	Mean	SD	Effects
Pretest	6.00	2.14	5.63	1.60	t = .40
Unit test	10.63	3.34	8.25	4.71	F = 1.44
Maintenance test	9.25	5.97	6.50	3.59	F = 1.25

No significant differences ($p < .05$) were found between the experimental and control groups on the pretest, unit, or maintenance tests.

GOAL 3: TRAIN REGULAR EDUCATION TEACHERS TO TEACH CONTENT LESSONS USING AN EFFECTIVE TEACHING APPROACH, AND EXAMINE THE EFFECTS ON LD AND NONLD STUDENTS

In Goal 2 research (Research Activity 1 and Study 5), the effects of 2 teaching approaches and visual display charcteristics on LD adolescents' acquisition and retention of content material were investigated. Based on the outcomes of Studies 3, 4, and 5, it was determined that Study 6 in Goal 3 will extend the findings of 1 by: (a) training regular education teachers to teach content lessons using an effective learning set and teacher-guided practice, and (b) examine the effects on the academic performance of LD and normally-achieving adolescents in content classes.

Study 6: Examining the effects of learning set and guided practice techniques on regular education teachers' teaching performance and LD and nonLD students' acquisition and retention of content material.

Research Questions

1. What are the effects of teaching regular classroom teachers to use the learning set and guided practice to teach content lessons?
2. How will regular classroom teachers use of the learning set and guided practice influence LD and nonLD adolescents' acquisition and retention of content material?
3. What are the opinions of regular teachers regarding the development of the learning set and guided practice techniques and the effects of this teaching approach on the performance of their students?
4. Will LD and nonLD students be satisfied with the use of the learning set and guided practice techniques in their content classes?

Methods

Subjects and Setting

This study was implemented in a high school world geography class. The class was taught by a teacher certified to teach social studies in the state of Utah. She had two years experience. Twenty-six students had elected to take this class and had been randomly assigned to this teacher

through a computerized scheduling system. Of these twenty-six students, two were identified as learning disabled by criteria in the state of Utah. In addition, the teacher was asked to identify low-achieving students in her class. Low-achieving was defined as (a) attending school regularly, (b) no identifiable disability, and (c) difficulty completing assignments and passing tests. Two low-achievers, were targeted for data collection.

Measures

Content tests. The teacher provided a list of instructional objectives each week and developed/administered a curriculum-based test each week based on the week's lesson. Each curriculum-based test contained 15 test items and included a variety of question formats, i.e., true/false, short answer, multiple choice, and matching. The test was adminstered at the beginning of class on Friday. The teacher's student aides graded the tests and test scores were provided to the researcher on Friday afternoon.

Social validation. A rating form was developed to measure how the teacher and students felt about the instructional techniques used during the trimester. The form was similar to those used in the previous studies (see Study 1). The satisfaction form was given at the end of the study.

Verification of independent variable. A research assistant evaluated the fidelity of the instructional interventions from live instructional lessons daily to verify the independent variable was implemented as prescribed. All lessons were observed and evaluated for: (a) alignment of lesson to instructional objectives, (b) amount of time spent lecturing, (c) teacher-initiated interactions, (d) baseline procedures (when applicable), (e) learning set procedures (when applicable), (f) guided practice procedures (when applicable), and (g) additional types of instructional activities conducted during the class. For the learning set, three types of data were recorded: (a) the total time of the learning set, (b) the interaction between teacher and students during the review, summarized as the number of student opportunities to respond per minute, and (c) the essential components of the learning set. For the guided practice, three types of data were

collected: (a) the time spent in each segment of guided practice, plus the total amount of time spent practicing, (b) the interaction between teacher and students during guided practiced, summarized as the number of student opportunities to respond per minute, and the essential components of guided practice. The data for interaction between teacher and students is displayed in Table 1, Teacher Rates; and the data for percent of learning set and guided practice components implemented are displayed in Table 2, Teacher Percents. The researcher independently evaluated 25% of the lessons. Interobserver agreement ranged from 87% to 96%.

Design

An ABAB single subject reversal design was used in this study to determine (a) the effects of the teacher training on the geography teacher's teaching behaviors, and (b) the effects of the teachers' performance on students' weekly test scores. The four conditions of the study were: (a) baseline 1, (b) learning set intervention, (c) baseline 2, and (d) learning set plus teacher guided practice.

Procedures

All lectures and curriculum-based tests were developed by the classroom teacher.

Baseline 1: During baseline 1, the teacher was instructed to (a) not review any content from previous classes, (b) not state objectives for class that day, (c) not talk about reasons for students learning the material, and (d) not to stop and ask questions during lectures in order to check students' comprehension. Baseline 1 lasted 9 school days.

Learning Set: Prior to the beginning of the second condition, the teacher was trained to develop and implement a learning set at the start of each class. Training included guidelines for the five components of the learning set: review, providing feedback, stating an objective and link, providing a rationale, and stating performance expectations. The learning set condition lasted 21 school days.

Table 1
Rate of Interaction Between Teacher and Students

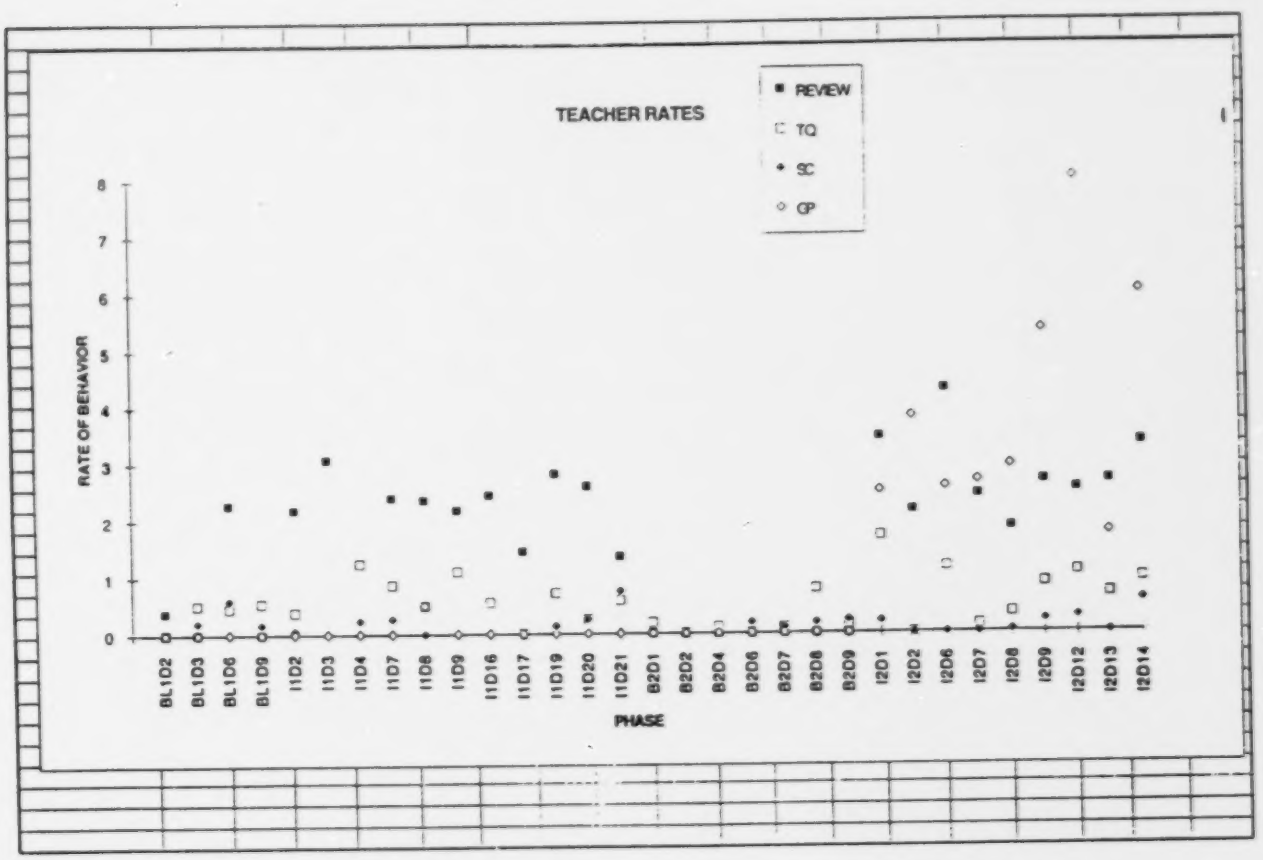

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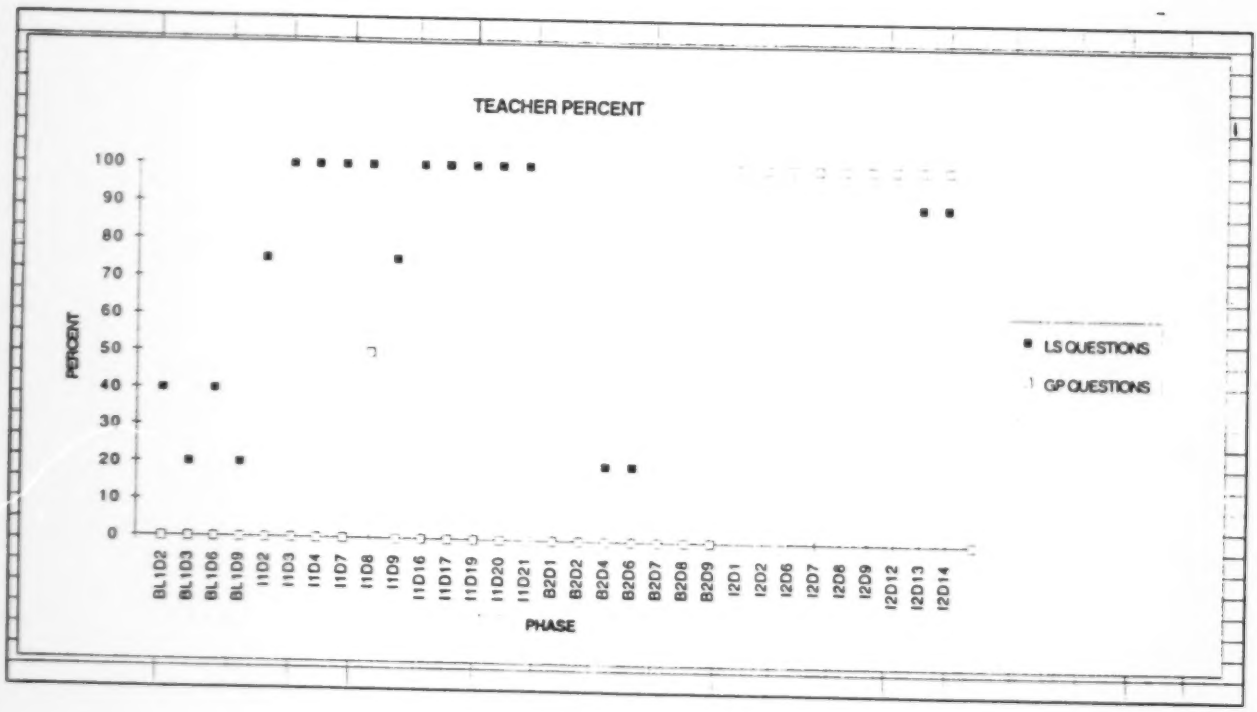
Table 2
Teacher Implementation of Learning Set and Guided Practice



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Baseline 2: Return to baseline followed the learning set intervention and lasted 9 school days. The teacher retrained on what she could and could not do during this period.

Learning Set plus Guided Practice: In this last condition the teacher returned to using the learning set procedures and also added the guided practice techniques. The guided practice required the teacher to (a) break the lesson into two or three smaller units of information, and following each unit of information with opportunities for the students to practice the material and for the teacher to check comprehension.

Results

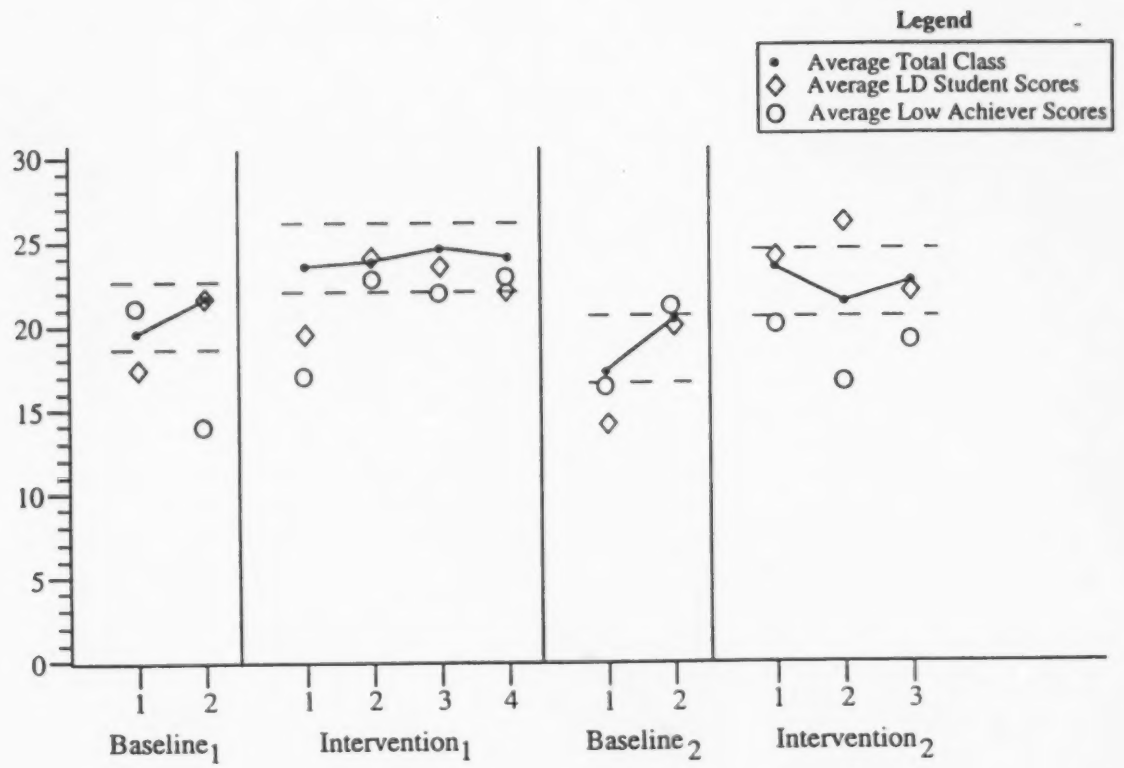
Student performance data for the total class, LD students, and low-achieving students is displayed in Table 3.

Discussion

Two points can be made regarding the outcomes for this student. First, it appears the learning set intervention by itself was more helpful to students than when the learning set plus guided practice is combined. This is consistent with the earlier studies with LD students only. In Study 1, LD students receiving the learning set only scored significantly higher on unit and maintenance tests than LD students in the control group. Similar outcomes were found in Study 2 when only guided practice was provided. However, in Study 4, when learning set, guided practice, and independent practice were combined (a lot more practice!), no significant differences were found between the experimental and control groups. In both cases (Study 4 and Study 6) it appears that more practice does not necessarily mean enhanced student performance. It is an interesting question that must be investigated with further research.

The second point has to do with students ability to compensate when teacher directed practice is withdrawn. Looking at Baseline 1, Quiz 1, you can see students did poorly without the teacher direction they were used to. However, the second week they compensated for the lack of teacher direction and relied on their own resources to prepare for the quiz - and scores improved. Similarly, in Baseline 2, scores initially dropped when the learning set was discontinued, but then

Table 3
Student Performance on Weekly Quizes



Student Scores for Mainstream Class

students took it upon themselves to provide the practice and focus the teacher had provided - and scores improved the next week. This point is not surprising for a regular class at the high school level - after all, students are expected to be independent learners. Even the learning disabled students in this class had the skill and motivation to work for better grades.

GOAL 4: DISSEMINATE RESEARCH FINDING NATIONWIDE

Based on the outcomes of Studies 1 through 6, I have been able to only partially fulfill my proposed dissemination plans. Only Studies 1 and 2 resulted in positive outcomes for students with learning disabilities. The following dissemination activities have been completed for these studies:

1. A manuscript describing Study 1 has been published in Learning Disabilities Research & Practice (1996), Volueme 11 (2), pages 78 - 85.
2. Studies 1 and 2 have been presented at the 1995 Council for Learning Disabilities International Convention in Chicago.
3. A manuscript describing Study 2 is under review with Learning Disabilities Quarterly.